

## ABSTRACT

A method of lowering the dielectric constant of an organosilicon low k dielectric layer while improving the hardness and thermal stability is provided. A deposited layer of carbon doped oxide, HSQ, or MSQ is cured and treated with a He plasma which improves hardness for a subsequent CMP step and lowers the dielectric constant. There is no loss of H<sub>2</sub>O or CH<sub>4</sub> during the He treatment. The low k dielectric layer is then treated with a H<sub>2</sub> plasma which converts some of the Si-O and Si-CH<sub>3</sub> bonds near the surface to Si-H bonds, thereby further lowering the dielectric constant and increasing thermal stability that improves breakdown resistance. Moisture uptake is also reduced. The method is especially useful for interconnect schemes with deep sub-micron ground rules. Surprisingly, the k value obtained from two different plasma treatments is lower than when two He treatments or two H<sub>2</sub> treatment are performed.